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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/713,254	11/17/2003	Jong Jin Park	3811-0129P	4772

2292 7590 03/22/2005

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EXAMINER

LEE, SIN J

ART UNIT	PAPER NUMBER
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1752

DATE MAILED: 03/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/713,254	PARK ET AL.	
	Examiner	Art Unit	
	Sin J. Lee	1752	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 November 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 11 is/are rejected.
- 7) ☒ Claim(s) 10 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

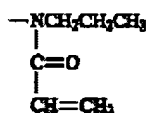
- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>11-17-2003</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. Claims 1-9 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoki (5,561,026) in view of Anazawa et al (US 2001/0050219 A1) and Irving et al (4,439,291).

Aoki teaches a photosensitive resist material (*useful for the production of semiconductors*) comprising fullerenes that contain photosensitive groups, which are obtained by adding photosensitive groups (such as methacryloyl group) to the fullerene (see col.1, lines 7-15, col.2, lines 39-54). Specifically, in Example 1, Aoki teaches a reaction product of a (n-propylamine modified) fullerene and *methacryloyl chloride* (which teaches present Formula 1 of claim 2), and the resultant product contains the following moiety



Aoki forms a film of photosensitive resist material (that contains the modified fullerene as discussed above) onto a silicon wafer by spin-coating his photosensitive resist solution and then pre-heating the coating (see col.2, lines 45-49 and Example 1). The resist film is then exposed to a light source such as UV light, deep UV light, X-ray, or electron beam and then subjected to development to obtain a resist pattern. Therefore, the prior art teaches present method of claim 1 except for using carbon nanotubes in present step (a) and using photoinitiator together with the nanotubes in present step (b).

Anazawa teaches that carbon nanotube is made up of carbon atoms only *in the same manner as the fullerene* and is discovered to possess the *photosensitive effect* and a function as a *semiconductor* and the like (see [0006]). Anazawa furthermore states that the fullerene also has a property as a *semiconductor* and it also exhibits a *photosensitive effect* (see [0005]). Based on this teaching, it would have been obvious to one of ordinary skill in the art to use carbon nanotube in Aoki's Example 1 (instead of the fullerene) and modify the carbon nanotube with methacryloyl chloride because fullerene and carbon nanotubes were art-recognized equivalents at the time the invention was made. Therefore, Aoki in view of Anazawa would render obvious present step (a) of claim 1.

Also, although Aoki does not explicitly state that it is using a photoinitiator along with the fullerene, it is well known in the art to use photoinitiators (such as *benzoin*, acetophenones, or *benzophenones*) in an *(meth)acryloyl group*-containing photosensitive composition in order to shorten the exposure time required for photopolymerization as evidenced by Irving et al (see abstract, col.9, lines 12-15, col.17, lines 19-33). Therefore, it would have been obvious to one of ordinary skill in the art to use photoinitiators in Aoki's photosensitive resin composition in order to shorten the exposure time as taught by Irving. Therefore, Aoki in view of Irving would render obvious present step (b) of claim 1.

Thus, Aoki in view of Anazawa and Irving would render obvious present inventions of claims 1, 2, and 4-9 (present claim languages of claims 5 and 6 do not require the presence of a special grade photoinitiator or a co-polymerizable

photoinitiator; they only require that *if* the photoinitiator of present claim 4 happens to be a special grade photoinitiator or a co-polymerizable photoinitiator, then those photoinitiators have to be selected from those listed in claims 5 and 6 respectively).

With respect to present claim 3, Anazawa teaches ([0020]) a method of manufacturing carbon nanotubes by reducing the pressure inside a system to 1.3 Pa or lower; supplying a carboniferous liquid state material to raise the pressure inside the system to at least 1.3 kPa to 93.3 kPa; generating *arc discharges*; supplying the carboniferous liquid state material in discharge plasma created by the arc discharges; and disintegrating or exciting the carboniferous liquid state material to produce the carbon nanotubes. Therefore, Aoki in view of Anazawa and Irving would render obvious present invention of claim 3.

With respect to present claim 11, Aoki teaches that such resins as polystyrene or phenolic resins can be used in combination with his photosensitive materials of his invention (see col.3, lines 40-45). Therefore, Aoki in view of Anazawa and Irving would render obvious present invention of claim 11.

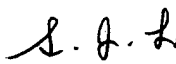
Allowable Subject Matter

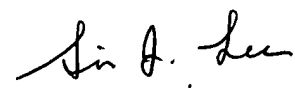
2. Claim 10 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Aoki does not teach or suggest the use of additional monomers or oligomers containing double bonds as presently required in claim 10.

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sin J. Lee whose telephone number is 571-272-1333. The examiner can normally be reached on Monday-Friday from 9:00 am EST to 5:30 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia Kelly, can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


S. Lee
March 20, 2005


Sin J. Lee
Patent Examiner
Technology Center
1700